NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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PREDICTED HORIZONTAL VELOCITY FOR SPACECRAFT LAND LANDNGS CALCULATED DURING THE APOLLO 8 MISSION

Flight Analysis Branch

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MANNED SPACECRAFT CENTER
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PROJECT APOLLO

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By Samuel R. Newman and Dallas G. Ives
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SUMMARY

This internal note presents prelaunch measured wind data and predicted horizontal velocities for spacecraft landings during the Apollo 8 mission.

INTRODUCTION

The present design capability of the Apollo spacecraft indicates that in the event of a mode 1 launch escape vehicle (LEV) abort, a land landing is acceptable provided that the spacecraft horizontal velocity at landing does not exceed 54 fps. A procedure was established to provide real-time data concerning the spacecraft horizontal landing velocity during the prelaunch countdown (ref. 1). This procedure was used during the prelaunch countdown for the Apollo 8 mission.

These data were available to the Manned Spacecraft Center Flight Director and the Kennedy Spacecraft Center Launch Director to aid them in their GO - NO-GO criteria.

WIND PROFILE MEASUREMENT

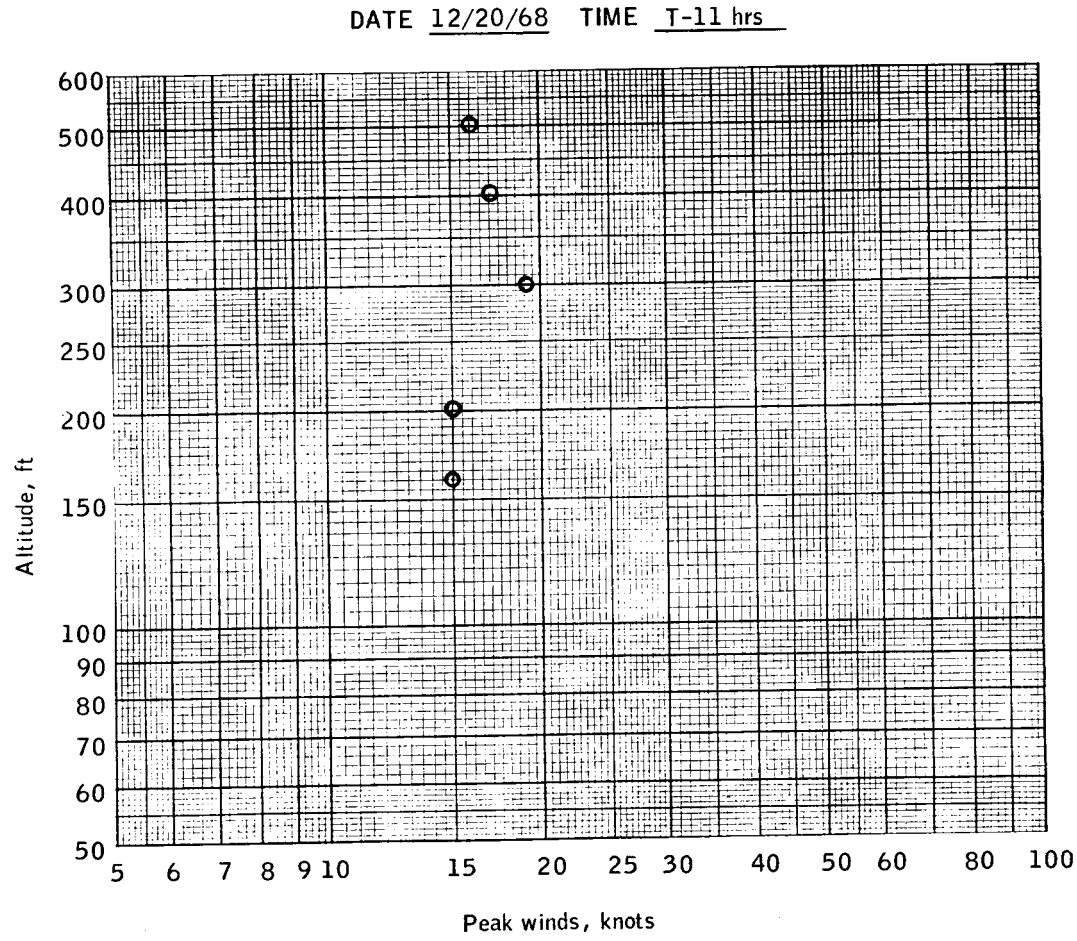
The wind profile measurements prior to lift-off (T hours) were recorded at T-minus-11 hours, T-minus-6-hours, T-minus-3.5-hours, T-minus-2.5-hours, T-minus-1-hour, and T-minus-0.5-hour in support of the Apollo 8 mission. The parameters measured for each of these times were altitude and peak wind velocity.

These data were plotted and are presented in figure 1. The peak wind velocity, wind profile slope (P), and the predicted horizontal landing velocity for each time prior to lift-off is tabulated and presented in table I.

All of the predicted horizontal velocities were below the spacecraft landing restriction of 54 fps.

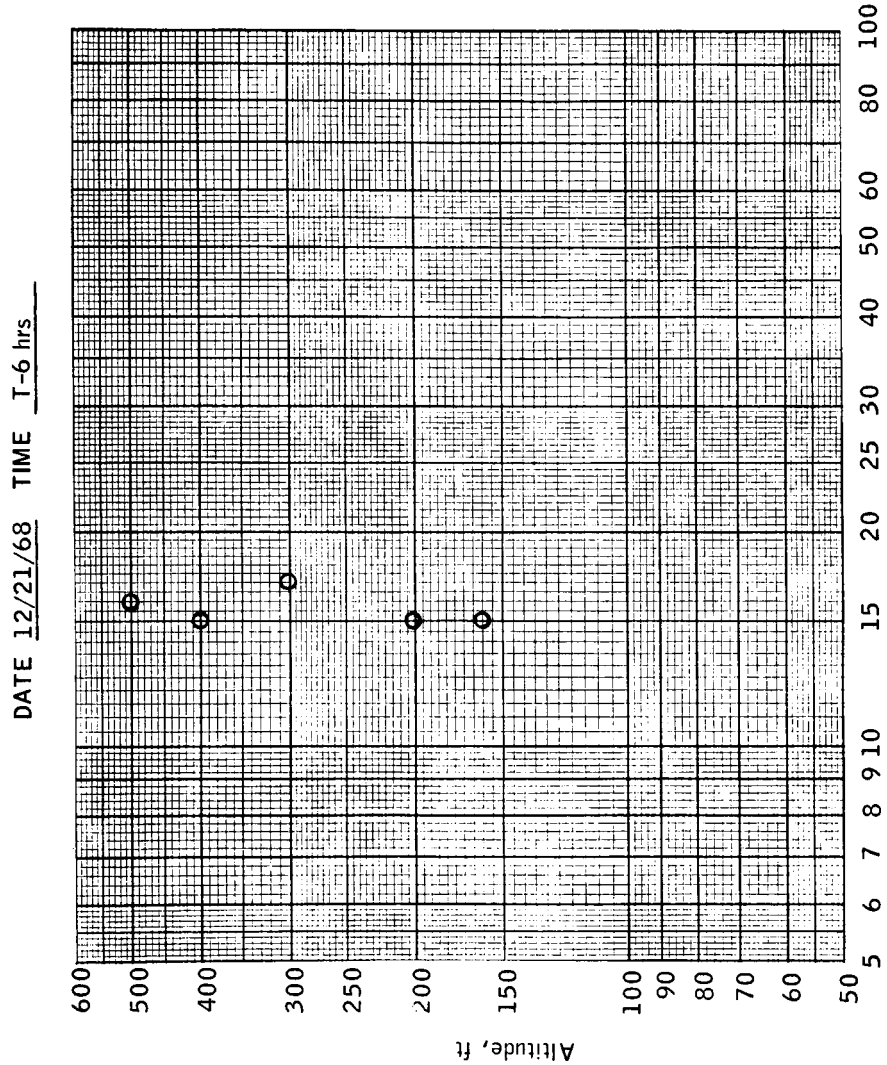
TABLE I.- APOLLO 8 MISSION PRELAUNCH WIND DATA

Time prior to lift-off, hr	Peak velocity, knots					Wind profile slope, P	Predicted horizontal landing velocity, fps
	162-ft altitude	200-ft altitude	300-ft altitude	400-ft altitude	500-ft altitude		
T-11	15	15	19	17	16	0.125	28
T-6	15	15	17	15	16	0.04	27
T-3.5	15	15	16	16	16	0.06	26
T-2.5	15	14	17	15	17	0.0	26
T-1	16	17	19	19	20	0.19	32
T-0.5	17	17	19	19	21	0.15	32



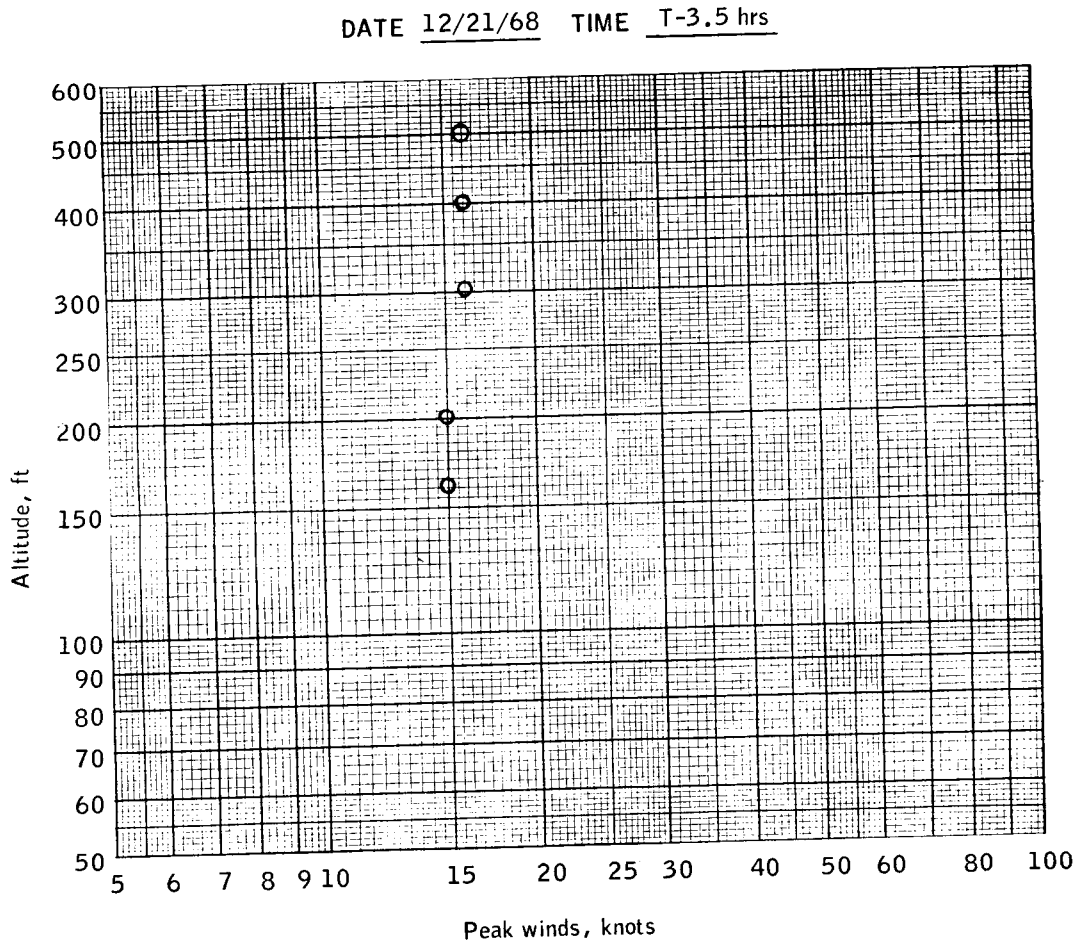
(a) T-11 hours winds.

Figure 1.- Peak wind velocity versus altitude.



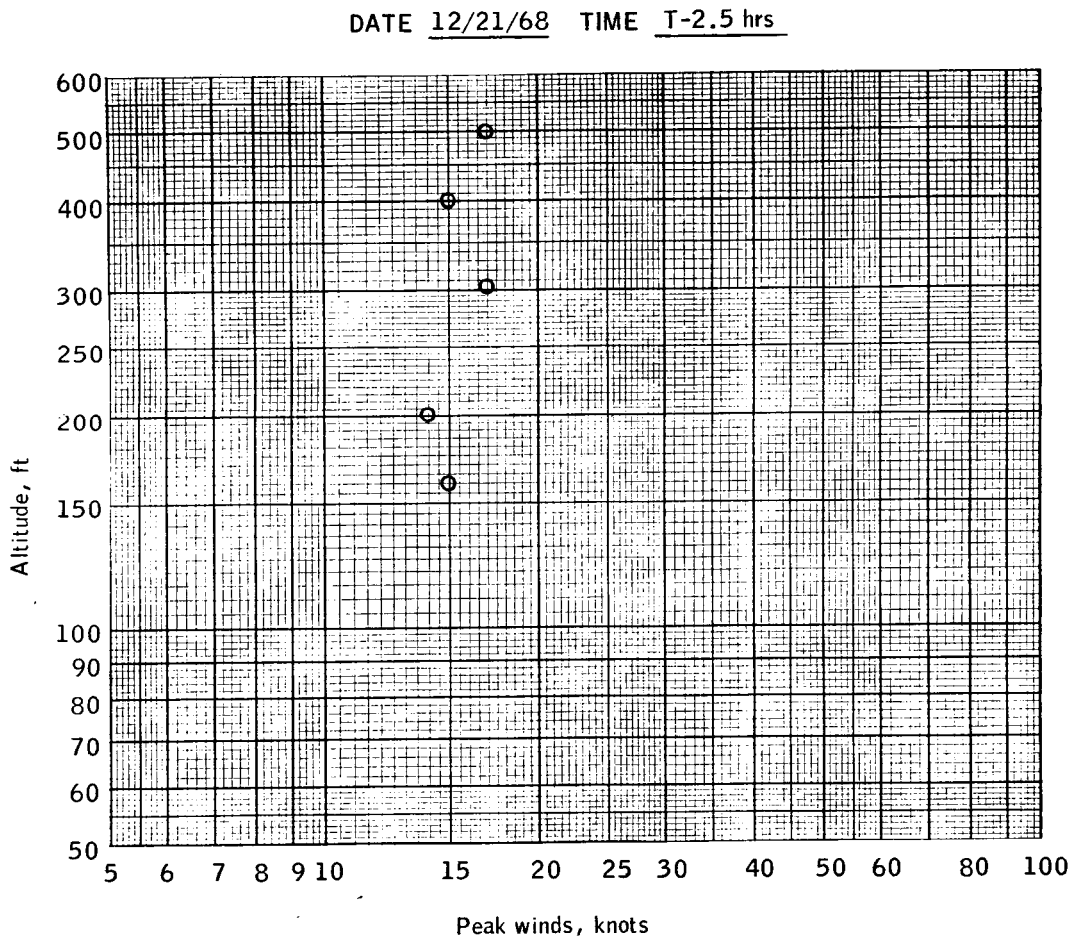
(b) T-6 hours winds.

Figure 1.- Continued.



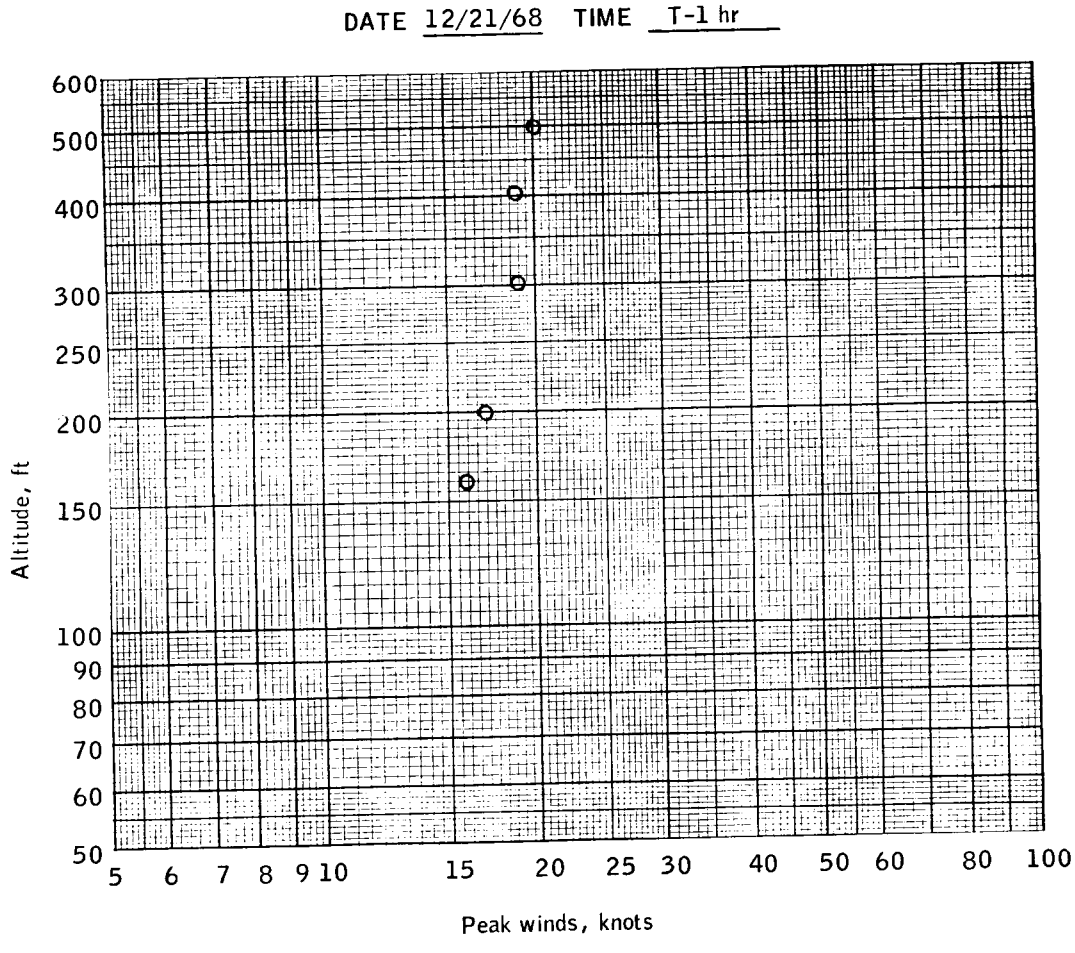
(c) T-3.5 hours winds.

Figure 1.- Continued.



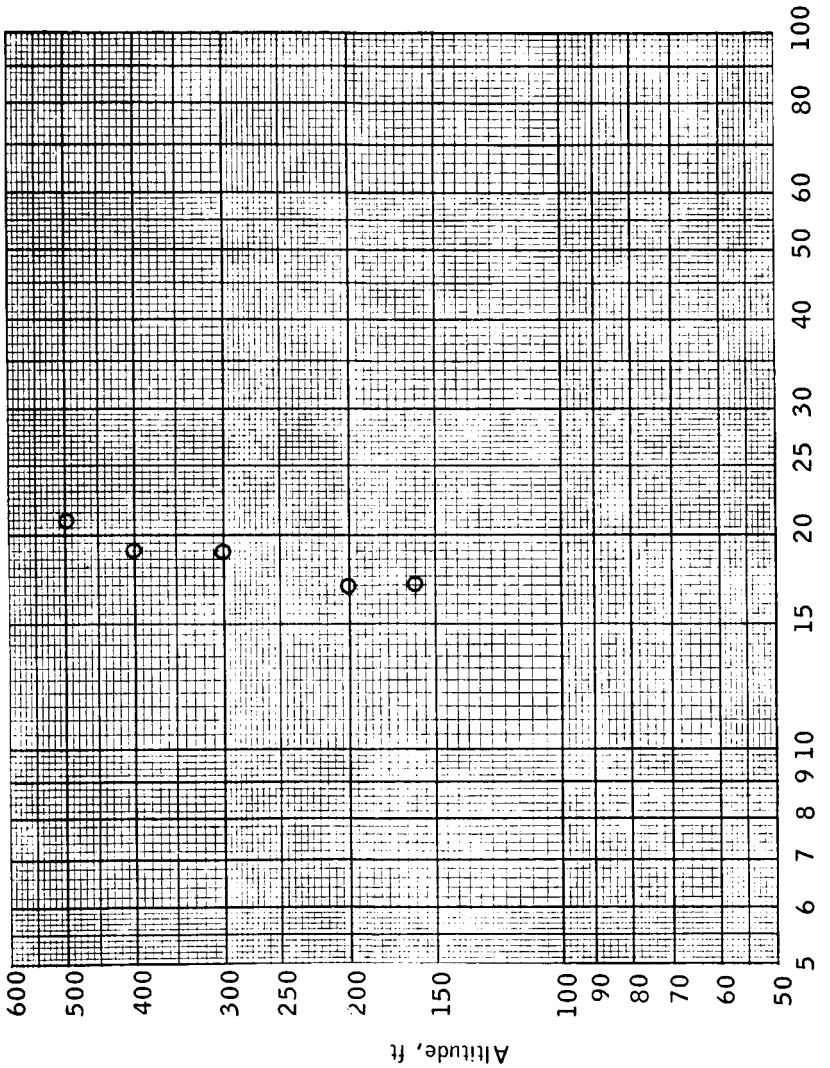
(d) T-2.5 hours winds.

Figure 1.- Continued.



(e) T-1 hour winds.

Figure 1.- Continued.



(f) T-0.5 hour winds.

Figure 1.- Concluded.

REFERENCE

Newman, Samuel R.; and Ives, Dallas G.: Predicted Horizontal Velocity for Spacecraft Land Landings Calculated during the Apollo 8 Countdown Demonstration Test (CDDT). MSC IN 69-FM-2, January 7, 1969.